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LI, SHI K				
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

## Application No.

10/606,935

## Applicant(s)

TERAHARA ET AL.

## Examiner

Shi K. Li

## Art Unit

2613

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 01 July 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1, 3-17 and 26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 3-17 and 26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-85/86)  
Paper No(s)/Mail Date 6/2/2009, 6/22/2009
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Claim Rejections - 35 USC § 103***

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
2. Claims 1, 16-17 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al. (S. Bigo et al., "Improving Spectral Efficiency by Ultra-Narrow Optical Filtering to Achieve Multi-Terabit/s Capacities", OFC 2002, 17-22 March 2002) in view of Miyamoto et al. (U.S. Patent 6,865,348 B2), Ramaswami et al. ("Optical Network: A Practical Perspective" by R. Ramaswami et al., Morgan Kaufmann, 1998, pp. 177-180) and Guy (U.S. Patent 6,690,886 B 1).

Regarding claims 1, 16-17 and 26, Bigo et al. teaches in the first paragraph of the *Introduction* WDM transmission system in which signal lights with different wavelengths are multiplexed (see FIG. 1). Bigo et al. teaches in the first paragraph of *Centered filters in transmitter* demultiplexing and receivers at the receiving end. Bigo et al. teaches both NRZ and RZ signal format (see FIG. 1). Bigo et al. teaches in first paragraph of *Centered filters in transmitter* inserting centered optical filters at the transmitting end before wavelength multiplexing (see FIG. 1) for improving spectrum efficiency. The difference between Bigo et al. and the claimed invention is that Bigo et al. does not teach super-Gaussian filters. However, super-Gaussian filters are well known in the art. For example, Miyamoto et al. teach in FIG. 2B optical filter 82. Miyamoto et al. teaches in FIG. 44D and col. 30, lines 50-55 super-Gaussian filter of order  $m$ . One of ordinary skill in the art would have been motivated to combine the teaching of Miyamoto et al. with the WDM transmission system of Bigo et al. because a super-Gaussian filter with order  $m > 1$  gives high suppression ratio for crosstalk. Thus it would have

been obvious to one of ordinary skill in the art at the time the invention was made to use super Gaussian or order  $m>1$ , as taught by Miyamoto et al., in the transmission system of Bigo et al. because a super-Gaussian filter with order  $m>1$  gives high suppression ratio for crosstalk.

The Applicant argues that Bigo et al. teaches in FIG. 1 both RZ and NRZ. Of course, using whether RZ or NRZ for transmission is an engineering choice. Since Bigo et al. teaches either RZ and NRZ can be used for optical transmission, the claimed invention is obvious in view of the combination of Bigo et al. and Miyamoto et al. The Examiner further cites Ramaswami et al. for supporting the using of NRZ. Ramaswami et al. teaches on page 179, 8th line from the bottom, "In practice, the NRZ format is used in most high-speed communication systems." One of ordinary skill in the art would have been motivated to combine the teaching of Ramaswami et al. with the modified WDM transmission system of Bigo et al. and Miyamoto et al. to use NRZ for transmission because it is compatible with most other communication systems and can reuse most part of the design and components of other communication systems. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use NRZ for transmission, as taught by Ramaswami et al., in the modified WDM transmission system of Bigo et al. and Miyamoto et al. to use NRZ for transmission because it is compatible with most other communication systems and can reuse most part of the design and components of other communication systems.

The combination of Bigo et al., Miyamoto et al. and Ramaswami et al. still fails to teach calculating spectrum efficiency at which a performance index is maximized. However, Guy teaches in col. 3, lines 39-48 and col. 6, lines 25-35 that spectrum efficiency is a compromise between channel spacing and degradation of signal quality caused by effects such as crosstalk.

One of ordinary skill in the art would have been motivated to combine the teaching of Guy with the modified WDM transmission system of Bigo et al., Miyamoto et al. and Ramaswami et al. because reducing channel space increases spectrum efficiency. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to minimize degradation and channel spacing, i.e., maximizing  $(B/S)$  and  $1/\Delta Q$ , as taught by Guy, in the modified WDM transmission system of Bigo et al., Miyamoto et al. and Ramaswami et al. because reducing channel space increases spectrum efficiency.

3. Claims 3-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al., Miyamoto et al., Ramaswami et al. and Guy as applied to claims 1, 16-17 and 26 above, and further in view of Frankel et al. (U.S. Patent 6,496,297 B1).

Bigo et al., Miyamoto et al., Ramaswami et al. and Guy have been discussed above in regard to claims 1, 16-17 and 26. The difference between Bigo et al., Miyamoto et al., Ramaswami et al. and Guy and the claimed invention is that Bigo et al., Miyamoto et al., Ramaswami et al. and Guy do not teach that the spectrum efficiency is 0.574 bit/s/Hz. However, spectrum efficiency is an engineering figure which depends on many factors. For example, Frankel et al. teaches in col. 5, line 51 spectral efficiency of 0.7 bits/s/Hz and teaches in col. 5, line 59-60 that spectrum efficiency may be increased to 1 bit/s/Hz. Literature in the art teaches various spectrum efficiency values and, therefore, specifying a particular value or a particular range of values is not patentable.

Regarding claim 4, given maximum spectral efficiency 0.574 bits/s/Hz, grid I and bit rate B, it is obvious that  $B/(kI)$  is the actual spectrum efficiency and  $B/(kI)$  must be smaller than or

equal to 0.574 bit/s/Hz. The smallest  $k$  such that  $B/(kI) < 0.574$  bit/s/Hz is the minimum value for  $k$ .

Regarding claims 5 and 7, if  $B/I$  is 1.6 bit/s/Hz,  $k=1$  gives a spectral efficiency of 1.6 bit/s/Hz which is not possible,  $k=2$  gives a spectrum efficiency of 0.6 which is also not possible while  $k=3$  gives a spectrum efficiency of 0.53 which is less than the maximum value.

Regarding claim 6, for  $I$  of 25 GHz, frequency spacing is  $kI = 75$  GHz.

Regarding claim 8, set  $\Delta f = 75$  GHz and  $f_b = 40$  to 50 GHz give their ratio as 1.875 and 1.50.

Similar arithmetic gives results of claims 9-12.

4. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al., Miyamoto et al., Ramaswami et al. and Guy as applied to claims 1, 16-17 and 26 above, and further in view of Ramaswami et al.2 ("Optical Networks", second Edition by Ramaswami et al., Academic Press, 2002, Published 12 October 2001, pp. 139-143).

Bigo et al., Miyamoto et al., Ramaswami et al. and Guy have been discussed above in regard to claims 1, 16-17 and 26. The difference between Bigo et al., Miyamoto et al., Ramaswami et al. and Guy and the claimed invention is that Miyamoto et al., Ramaswami et al. and Guy do not teach arrayed waveguide grating. Ramaswami et al.2 teaches on pp. 139-143 arrayed waveguide grating as multiplexer/demultiplexer. One of ordinary skill in the art would have been motivated to combine the teaching of Ramaswami et al.2 with the modified WDM transmission system of Bigo et al., Miyamoto et al., Ramaswami et al. and Guy as an engineering design choice. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to Use an arrayed waveguide grating as multiplexer/demultiplexer, as taught

by Ramaswami et al.2, in the modified WDM transmission system of Bigo et al., Miyamoto et al., Ramaswami et al. and Guy as an engineering design choice.

5. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al., Miyamoto et al., Ramaswami et al., Guy and Frankel et al. as applied to claims 3-12 above, and further in view of Ramaswami et al.2 ("Optical Networks", second Edition by Ramaswami et al., Academic Press, 2002, Published 12 October 2001, pp. 139-143).

Bigo et al., Miyamoto et al., Ramaswami et al., Guy and Frankel et al. have been discussed above in regard to claims 3-12. The difference between Bigo et al., Miyamoto et al., Ramaswami et al., Guy and Frankel et al. and the claimed invention is that Bigo et al., Miyamoto et al., Ramaswami et al., Guy and Frankel et al. do not teach arrayed waveguide grating. Ramaswami et al.2 teaches on pp. 139-143 arrayed waveguide grating as multiplexer/demultiplexer. One of ordinary skill in the art would have been motivated to combine the teaching of Ramaswami et al.2 with the modified WDM transmission system of Bigo et al., Miyamoto et al., Ramaswami et al., Guy and Frankel et al. as an engineering design choice. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use an arrayed waveguide grating as multiplexer/demultiplexer, as taught by Ramaswami et al.2, in the modified WDM transmission system of Bigo et al., Miyamoto et al., Ramaswami et al., Guy and Frankel et al. as an engineering design choice.

Note that interleaver using an interference filter is well known in the art. For example, see Gu (U.S. Patent 6,611,340 B2).

6. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al., Miyamoto et al., Ramaswami et al., Guy and Frankel et al. as applied to claims 3-12 above, and further in view of Koshi (U.S. Patent Application Pub. 2002/0025111 A1).

Bigo et al., Miyamoto et al., Ramaswami et al., Guy and Frankel et al. have been discussed above in regard to claims 3-12. The difference between Bigo et al., Miyamoto et al., Ramaswami et al., Guy and Frankel et al. and the claimed invention is that Bigo et al., Miyamoto et al., Ramaswami et al., Guy and Frankel et al. do not teach dielectric multi-layer film filter. Koshi teaches in FIG. 2 a wavelength multiplexer 2. Koshi teaches in paragraph [0099] that Mach-Zehnder interferometer type wavelength multiplexer, arrayed waveguide grating or dielectric multi-layer filter can be used for multiplexer 2. One of ordinary skill in the art would have been motivated to combine the teaching of Koshi with the modified WDM transmission system of Bigo et al., Miyamoto et al., Ramaswami et al., Guy and Frankel et al. as an engineering design choice. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a dielectric multi-layer film filter as multiplexer/demultiplexer, as taught by Koshi, in the modified WDM transmission system of Bigo et al., Miyamoto et al., Ramaswami et al., Guy and Frankel et al. as an engineering design choice.

#### ***Response to Arguments***

7. Applicant's arguments filed 1 July 2009 have been fully considered but they are not persuasive.

The Applicant argues that according to MPEP 2143.03, all claim limitations must be taught or suggested. (To establish prima facie obviousness of a claimed invention, all the claim



limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974.) The quoted section of MPEP 2143.03 is no longer appropriate and has been deleted from the MPEP in the September 2007 revision.

MPEP 2143.03 further states that “All words in a claim must be considered in judging the patentability of that claim against the prior art”. In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPAS 1970). According, the Examiner has considered the phrase “maximizing a product of a transmission distance and a transmission capacity of the system” and determined that the phrase is an objective or intended purpose of the filters and fails to differentiate the claimed invention from the prior art.

Furthermore, the Examiner has added reference Guy for the rejection of claim 1. Guy teaches to minimize degradation and channel spacing, i.e., maximizing (B/S) and  $1/\Delta Q$ , and therefore, maximizing capacity. Applicant’s arguments are moot in view of the new ground(s) of rejection.

### ***Conclusion***

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shi K. Li whose telephone number is 571 272-3031. The examiner can normally be reached on Monday-Friday (6:30 a.m. - 4:00 p.m.).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Vanderpuye can be reached on 571 272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

skl  
27 September 2009

/Shi K. Li/  
Primary Examiner, Art Unit 2613